News Update Summer 2020



How the humble sea sponge helped scientists unravel a 700 million yearold mystery of evolution Australian scientists, including from the Centenary Institute, have found that humans, and most likely the entire animal kingdom, share important genetic mechanisms with a jelly-like sea sponge that comes from the Great Barrier Reef.

Published in the prestigious journal 'Science', the research revealed that some elements of the human genome (our complete set of DNA) functions in the same way as the prehistoric sea sponge. The mechanisms–which drive gene expression–key to species diversity across the animal kingdom, have been preserved across 700 million years of evolution.

The findings are a fundamental evolutionary discovery with the researchers noting that their work will help drive future biomedical research activities.

"This work is incredibly exciting as it allows us to better 'read' and understand the human genome, which is an incredibly complex and everchanging instruction manual of life," said senior study author Associate Professor Mathias Francois from the Centenary Institute.

"Being able to better interpret the human genome aids our understanding of human processes, including disease and disorders, many of which have a genetic basis. The more we know about how our genes are wired, the better we are able to develop new treatments for diseases."

Associate Professor Mathias Francois, Centenary Institute (above, left), Dr Emily Wong, Victor Chang Cardiac Research Institute and collaborators have made a major genetic breakthrough.

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New understanding of how proteins operate

A ground-breaking discovery by Centenary Institute scientists has provided new understanding as to the nature of proteins and how they exist and operate in the human body.

The key finding-the changing state of a protein's structural bonds-is likely to have significant implications as to how proteins are targeted by medical researchers, particularly in terms of drug development and the fight against disease.

Proteins, responsible for all of life's processes had previously been considered to exist in an intact single state when mature. The new study found however two human proteins involved in blood clotting and immunity existing in different and changing states.



"It's very likely that we will find many other proteins that exist in multiple states. Crucially, a drug may bind more or less preferentially to different Professor Philip Hogg (right) and Dr Diego Butera have made a groundbreaking discovery.

states, impacting the effectiveness of the drug," said Professor Philip Hogg, Head of the ACRF Centenary Cancer Research Centre and senior author of the study.

"In experimental settings, differing states of a protein should now be considered as part of the investigative medical research process."

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Heart defects revealed

Centenary Institute researchers have discovered that genetic testing can identify 'concealed cardiomyopathies' in nearly a quarter of sudden cardiac arrest (SCA) survivors who seem to have a normal heart. Cardiomyopathies are diseases of heart muscle.

"Our study has shown that advances in genetic testing technology and analysis can improve diagnosis rates by revealing heart defects that were previously hidden," said Professor Christopher Semsarian AM, Head of the

Centenary Institute's Agnes Ginges Centre for Molecular Cardiology and senior author on the study.

"A reassessment of guidelines and increased genetic testing may lead to better outcomes for survivors, their families and overall prevention of sudden cardiac death in the young."



Dr Julia Isbister (above, left) and Professor Christopher Semsarian AM highlight the importance of genetic testing in sudden cardiac arrest survivors.

Gut microbiome link to deadly lung disease

Research led by the Centenary Institute, the University of Technology Sydney and the University of Queensland has shown for the first time a link between chronic obstructive pulmonary disease (COPD), an often fatal lung condition, and the gut microbiome.

The findings suggest that the gut may be helpful in diagnosing COPD and may also be a potential source of new therapeutic targets to help treat the chronic respiratory disorder.

COPD, a life threatening inflammatory disorder of the lungs, is the third most common cause of death globally. More than 3 million lives are lost every year to this disease.

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PROFILE

Dr Angela Fontaine

Angela has always been captivated by the ocean and has spent considerable time exploring the spectacular world that exists beneath the waves.

"Being underwater fascinates me," says Angela.

"It's an enthralling and special place filled with colour, beauty and life."

As an experienced divemaster, snorkeler and swimmer, Angela enjoys capturing the marine world with her camera and <u>sharing</u> her shots for others to see.

"I like to take photos to show the diversity that exists on our planet. The majority of all life is found beneath the waves yet we still have so much to learn about the ocean and the amazing and differing habitats that exist within it."

More recently, Angela has become a volunteer photographer for a whale-watching company in Sydney.

"I like to take close-up photos of the whales as they surface near the boat. Whales can be very inquisitive and curious and sometimes you get the feeling that they're studying you!"

At Centenary, Angela's imaging expertise is key where she works as the Institute's bioimaging specialist.

"Imaging allows us to visualise the biological processes taking place in the body, at the tissue, cellular and molecular level, helping us better understand the disease environment as well as to test potential new treatments and cures."

Learn more about our Humans of Medical Research www.centenary.org.au/meet-us



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